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Abstract

Value investment strategies are premised on research that value stocks outperform growth stocks. However, the research findings are dependent on the portfolio classification method that is used to sort stocks using the attributes of size and book-to-market ratios. Different stock markets contain different distributions of stocks, and in many markets, illiquidity concerns combined with a lack of investment scale, effectively create barriers to practical portfolio formations that align with the research. This study conducts a case study on one such market (Australia) and demonstrates that different methods of portfolio formation lead to different conclusions. For example, previous studies in Australia find evidence of the value premium only being present in the largest stocks, in contrast to the results from the US market. However, we find a value premium that is systematic across all size categories and generally increases inversely with size. Further, we find the previously pervasive size premium largely disappears once portfolios are formed that better represent feasible investment sets and once 'penny dreadfuls' are removed.

JEL Classification: G110, G120, G140

Keywords: Value Premium; Book-to-market effect; Investments; Fund Performance

1. Introduction

Research into the so-called 'value premium' wherein stocks classified as value out-perform their counterparts classified as growth stocks has moved beyond the academic literature to where specialist value managers are common place within the funds management industry. It is generally accepted in practice that the value managers come to the fore with downturns in the business cycle. However, value managers continue to attract investment funds throughout the business cycle and typically promote themselves as having expertise to identify under-priced stocks.

The vast bulk of the research into the value premium has been undertaken in the US equity market following the work of Fama and French (1992; 1993). While there is growing evidence of the pervasiveness of the value premium outside of the USA, it is nonetheless a strategy that is readily adopted in equity markets in which there is little established empirical evidence. That is, the key attributes of the value premium are translated across markets. However, the US equity market is different to many other equity markets. In particular, the US equity markets have relatively high levels of capitalization, coverage, liquidity and depth.

Further, the reliance on academic research which typically utilizes large cross-sectional databases to implement practical investment strategies warrants considerable caution. Fund managers often face restrictions on their investment set due to client mandates or the difficulty associated with taking an investment position in small and illiquid stocks. This issue is particularly relevant to the value premium given its interaction with firm size.

In this paper, we focus on the choices of empirical design when constructing portfolios to test the value premium. As the results show, what may appear to be relatively innocuous choices in portfolio construction can lead to substantially different conclusions. The empirical design choices on which we focus reflect some practical investment considerations. The paper uses the Australian equity market as the sample; while this market is often thought to have similar characteristics to the US market except on a smaller scale, the distribution of constituent stocks has ramifications for value investment strategies. For instance, using size sorts traditionally employed in prior Australian research, around 95% of the total market capitalization in Australia is accounted for by stocks in just one size quintile. Moreover, the smallest 60% of stocks comprise just 1.6% of total market capitalization. In comparison, the largest size quintile in the USA comprises around 75% of total market capitalization, while the smallest 60% of stocks still comprise around 13% of total market capitalization.

The differences between the distribution of stocks within and across markets is potentially problematic. It makes a meaningful comparison with benchmark studies difficult. Further, for markets such as Australia, questions arise as to how much relevance can be placed on analysis which includes stocks in portfolios which represent such an insignificant proportion of total market capitalization.

The underlying question of this paper is whether the value premium is systematic across the market and exploitable. The common approach adopted in studies of this topic involves a sort of stocks by two dimensions. That is, stocks are allocated to a portfolio on the basis of size and independently sorted into portfolios on the basis of their 'value-growth' characteristic. Each stock is therefore assigned to one size and book-to-market portfolio. However, the choice of the breakpoint which is used to form the portfolios is not clear. Given the inherent empirical nature of this type of study, there is no strong theory to guide the method of portfolio formation and hence studies have tended to follow previous work to determine the breakpoints. Our paper demonstrates the importance of the breakpoint in relation to conclusions that may be drawn about the value premium. Moreover, by providing new insight into the systematic nature of the value premium, the conclusions that follow have significant implications for value investment strategies.

2. Prior Research and Portfolio Formation

Studies that have examined the US equity market typically select breakpoints for portfolio formation based on the sample of New York Stock Exchange (NYSE) listed stocks. That is, all NYSE stocks are first ranked by market capitalization from smallest to biggest, then stocks are placed into five portfolios according to size. While stocks from other exchanges including NASDAQ and AMEX stocks are also placed into the portfolios, the portfolio allocation is based on the NYSE breakpoints. Because NASDAQ and AMEX stocks are, on average, much smaller than NYSE stocks the smaller size quintile portfolios comprise many more stocks than the bigger size quintile portfolios. To illustrate, Panel A of Table 1 reproduces Table II of Fama and French (2006), and shows that the smallest size quintile comprises 2,255 (or 58%) of the 3,858 sample stocks. In contrast, the largest size quintile accounts for just 8% of stocks by number. The dispersion in size of the constituent stocks is highlighted by the market capitalization figures. The smallest size quintile accounts for just 2.9% of total market capitalization compared to the largest size quintile which accounts for 73.6% of total market capitalization. Forming portfolios in this way mitigates the impact that poor liquidity may have on return calculations and better represents practical investment opportunities.

The disparity in the number of stocks across portfolios follows through to book-to-market (BM) sorts. For instance, the number of companies and percent of total market capitalization grows as stocks move from high BM (value) to low BM (growth), with the exception of the smallest size quintile. Of note, in the largest size quintile the growth stocks are on average twice the size of the value stocks. This may be partly due to NASDAQ and AMEX stocks being more likely to have the characteristics of growth than NYSE stocks.

The approach used in portfolio formulation outside of the US market typically involves the inclusion of all listed stocks to determine breakpoints (Bagella et al., 2000; Chui & Wei, 1998; Chan et al., 1991; Daniel et al., 2001; Docherty et al., 2010; Gaunt, 2004)[1].

[1] An exception is Dimson et al. (2003) who determine the big size breakpoint at 70% of ranked market capitalization in the UK market.

The consequence of this method is that each size quintile contains the same number of stocks and each BM quintile contains the same number of stocks, which is in contrast to the US approach. As the majority of stocks on most stock exchanges are relatively tiny this means that portfolios formed on the basis of equal numbers of stocks can be dominated by tiny stocks.[2] Depending on the distribution of stocks in the market, the approach can result in size-based portfolios that contain very small stocks and a small share of the total market capitalization.

To illustrate the issue, Table 1 Panel B4 presents descriptive statistics on Australian portfolios formed on the basis of breakpoints where an equal number of stocks is assigned to each portfolio. The result is that the four smallest size portfolios jointly comprise just 5% of the total market capitalization with the largest size portfolio comprising 95% of total market capitalization. Such a discrepancy means that analysis across size quintiles is of questionable value because portfolios dominated by tiny stocks are likely to suffer from illiquidity and microstructure anomalies associated with large abnormal returns and stale prices. Moreover, from a practical perspective, such portfolios may not be investable given that fund managers could not take a position without breaching investor mandates or significantly affecting the market price.

The question then arises whether this different methodology leads to inconsistent findings on the value premium across markets? Most studies generally find evidence that the value premium is pervasive across US stocks for both large and small stocks although the premium is generally greater for smaller US stocks (Fama and French, 1993; 2006). However, the evidence is not entirely consistent, with some studies suggesting that the value premium in the USA, since 1963, is *only* observable in small stocks or a select sub-set of stocks (Kothari, et al., 1995; Loughran, 1997). For example Loughran concludes that *'to really exploit the difference between value and growth firms requires concentrated portfolios in small quintile firms. This is something that can only be done by small funds, not large money managers.'* (p. 267).

Evidence of the value premium in markets outside of the USA is more limited, and the results are inconsistent. For example, Daniel, Titman and Wei (2001) using Japanese stocks find a strong value premium for the four largest size portfolios but an insignificant value premium in small stocks. Similar results are found in Australia where Halliwell, Heaney and Sawicki (1999), Gaunt (2004) and Kassimatis (2008) all find returns to high book-to-market portfolios are greater than returns to low book-to-market portfolios but this evidence is restricted to the three or four larger size quintiles. Chui and Wei (1998) study several Pacific-Basin stock markets and find that the value premium is higher in small companies when compared to large companies in Hong Kong, Korea and Malaysia, while in Thailand the reverse occurs with the premium being strongest in larger firms. Fama and French (2006) find that the value premium for small and large stocks is similar when aggregating stocks from 14 major markets outside the USA.

[2] For example, 60% of the total number of stocks comprise under 2% of total market capitalization in Australia (see Table 1).

In summary, studies of the US market suggest that the value premium is larger in smaller stocks where it may be difficult to exploit. In contrast, studies outside the US market suggest the premium is stronger in larger stocks although such a conclusion is difficult to draw across all markets. From a practical perspective, the finding of a value premium among larger stocks is more interesting because of the difficulties associated with taking positions in small stocks. But as we highlighted earlier, it is difficult to compare the international studies with the US studies given the large discrepancies in the constituency of the size portfolios. Hence, our study now analyses the performance of various portfolio formation methods.

First, we initially follow the traditional approach to portfolio construction and then compare these results with those obtained from other portfolio construction methods. To begin the initial construction of value and growth portfolios, all stocks are ranked by size and sorted in five portfolios with each portfolio containing the same number of stocks. We then rank stocks by book-to-market ratios (lowest to highest) and quintile portfolios of equal numbers of stocks are formed. That is, the first portfolio contains 20% of number of stocks with the lowest book-to-market ratio (growth), whereas the final book-to-market portfolio (value) contains the 20% of number of stocks with the highest book to market ratio. We term this Method 1.

This method has been used in several previous studies in Canada (Elfakhani, et al., 1998), Japan (Chan et al., 1991), several Pacific-Basin countries (Chui and Wui, 1998) and Australia (Gaunt, 2004; Halliwell, et al., 1999; Kassimatis, 2008). Hence, each stock is assigned to one size portfolio and one book-to-market portfolio. The intersection of these two sorts leads to the creation of twenty-five size-book-to-market portfolios. This process is rolled forward each year and value-weighted returns are calculated. This process results in a series of 300 monthly returns over the sample period (January 1982 to December 2006) for the twenty-five portfolios. Panel B of Table 1 documents the descriptive statistics associated with this approach which are discussed in the next section.

Second, five size portfolios are constructed such that the percentage of total market capitalization in each portfolio approximately corresponds with the equivalent portfolio size characteristics as documented in the US market. We term this Method 2. This approach involves first ranking each firm (largest to smallest) at the end of each December by market capitalization and assigning each stock to one of five size portfolios. The largest size portfolio contains the first *n* number of stocks that make up 75% of total market capitalization. The second portfolio contains the next *n* number of stocks that make up the next 15% of total market capitalization (i.e. those stocks ranked between 75-90%). The third portfolio contains the next 5% of total market capitalization (i.e. those stocks that are ranked between 90-95%). The fourth portfolio contains stock that make up the next 3% of total market capitalization (95-98%) and the smallest size portfolio contains the stocks that make up the last 2% of stocks (98-100%). These market capitalization breakpoints parallel the findings of Fama and French (2006), where the average percentage of total market capitalization in the largest size portfolio is 74%, the second largest size portfolio contains 13%, the next size portfolio contains 6%, while the

final two (smallest) size portfolios contain 4% and 3% respectively. This method also has the advantage that it results in similar percentages of the number of stocks in each portfolio between the Australian and US markets. For example, the smallest size portfolio in Australia contains 60% of stocks (Panel C of Table 1) while the corresponding portfolio in the USA contains 58% of stocks (Fama and French, 2006). Similarly, the largest size portfolio in Australia contains 6% of total number of stocks and in the USA the largest size portfolio contains 8% of stocks. The resultant portfolios are described in Panel C of Table 1 and while the large growth portfolio is still the largest component of market capitalization at 16%, there is a more even distribution across the portfolios.

The value and growth portfolios are then constructed using book-to-market breakpoints determined on the basis of sorts on the top 200 stocks and subsequently applied to the full sample of stocks. This method is akin to the Fama-French approach where the larger NYSE stocks are used to determine the book-to-market breakpoints. A further reason for only using top 200 stocks is it matches the primary index for the Australian equity market (ASX/S&P200). These stocks are likely to be liquid, regularly priced and hence exhibit more reliable book to market ratios.

Method 3 breaks stocks into size portfolios based on current Australian Stock Exchange indices. First, each firm is ranked by market capitalization (largest to smallest) at the end of each December. The largest size portfolio contains the largest fifty stocks, which will closely match the S&P/ASX 50 index, which '*represents the large cap universe for Australia*' (S&P website). The second size portfolio will contain the next 150 stocks (ie. stocks 51-200). The S&P/ASX 200 is one of the common benchmarks for institutional investor and the S&P/ASX 200 is '*designed to be the primary gauge for the Australian equity market'* (S&P website). The third size portfolio contains the next 100 stocks (ie. stocks 201-300) which coincides with the breakpoint for the next major benchmark on the ASX being the S&P/ASX 300 index. The next size portfolio contains the next 200 stocks (ie. stocks 301-500) which is loosely regarded as the point at which stocks start to fall outside of the investable universe for fund managers, while the smallest size portfolio contains all other listed stocks.[3]

The value and growth portfolios are again constructed using book-to-market breakpoints determined on the basis of sorts on the top 200 stocks and then applied to the full sample of stocks. The summary statistics of this approach are presented in Panel D of Table 1.

Method 4 is similar to Method 3 except that the value and growth portfolios are constructed by sorting stocks into quintile portfolios where each portfolio contains the same number of stocks. The summary statistics of this approach are presented in Panel E of Table 1.

Finally, Method 5 employs the same portfolio construction approach as Method 4 but on a reduced sample of stocks. Specifically, stocks with a price of less than $0.20 are excluded from the sample. This filter is designed to remove the 'low-price effect' which

[3] This is similar to one of the methods used in Brailsford and O'Brien (2008) that looks at the conflicting evidence of momentum and size in the Australian Market.

is commonly used as a proxy for liquidity and market microstructure issues. The summary statistics of this approach are presented in Panel F of Table 1.

3. Data and Summary Statistics

The data for this study derive from two sources. First, price, dividend, and market capitalization data are sourced from the Centre for Research in Finance (ABS-CRIF). Second, accounting information is hand-collected from annual reports for the period 1982 to 2006 (see O'Brien et. al., 2010 for full details) and is matched to the relevant price data. This approach results in coverage of over 98% of all listed stocks.

Following Fama and French (1992; 1993) we define book value as the total value of equity plus deferred tax[4] minus outside equity interests and the value of preference shares capital. Consistent with previous studies, companies with negative book values[5] and all property trusts[6] and investment funds are dropped from the sample. To form book-to-market ratios we match the book values to market capitalization information from the ABS-CRIF database. To be consistent with previous studies and to avoid any look-ahead bias, because the release of accounting information is later than the balance date on the annual report, only accounting information that is at least six months old is used. As 78.5% of companies in our sample report at 30 June we choose December as the portfolio formation date as this means the accounting information is the most recently available for the vast majority of companies. The final sample comprises 23,098 firm-years, with the smallest contribution from the year 1982 (522 companies) and the largest from the year 2006 (1,291 companies).

Table 1 reports the summary statistics of portfolios formed on the basis of Methods 1 to 5 (Panels B through F) and a comparison to the US portfolios of Fama and French (2006) in Panel A.

INSERT TABLE 1 (Appended)

Panel B reports on the portfolios formed from Method 1. Recall that that under this method, all stocks are sorted first by market capitalization with resultant size quintiles that contain an equal number of stocks. Similarly, at the portfolio formation date all stocks are independently sorted by book-to-market and then five portfolios are created with an equal number of stocks in each book-to-market group. Panel B confirms that each row and each column sums to 20% of all stocks.

From Panel B of Table 1, it is evident that the large size portfolio dominates the sample. For instance, the large size portfolio covers almost 95% of the Australian market capitalization. Moreover, the two largest portfolios, which comprise 40% of stocks, cover over 98% of total market capitalization. The skew is also apparent when the portfolios are sorted on book-to-market. For instance, the large growth portfolio covers 29% of total

[4] Deferred tax is taken as the difference between deferred tax liabilities and deferred tax assets as reported on the balance sheet.
[5] Negative book values make up less than 2.5% of all collected companies.
[6] Property trusts in Australia are similar to REITs in the USA.

market capitalization despite comprising only 5% of stocks. At the other extreme, none of the smallest portfolios exceed 0.1% of total market capitalization. The results in Panel B also demonstrate that a greater number of large stocks are classified as growth rather than value stocks and this reverses as we move down in size from the large to the micro quintile, consistent with prior research of the Australian market (e.g. Docherty et al., 2010; Halliwell et al., 1999; Kassimatis, 2008). The heavy weighting toward large growth stocks is also clearly evident in the US portfolios as documented in Panel A, whereas the smallest size group in the US portfolios reveals only a small bias toward value stocks.

A significant consequence of forcing an equal number of companies into each size group is to produce portfolios with low mean market capitalizations and proportion of total market capitalisation. In Panel B, this effect is particularly pronounced from a comparison of the large portfolios where the average market capitalization is well in excess of $1 billion whereas the micro portfolios comprise stocks with an average market capitalization of a mere $3 million. In Australia, the large portfolios have an average size that is 589 times as big as the average size of the micro portfolios. In comparison, the relative difference in the USA is 190 times. Even between the Large and second largest size portfolio the size difference is 26 times with the average market capitalization of the second largest size portfolio being only $68 million. This is in contrast to the US studies where the difference between the large portfolio and the second largest portfolio is approximately 7 times.

In summary, Panel B reveals that it is difficult to assert much economic importance to the four smallest size portfolios. In particular, any analysis is likely to be of only academic interest as stocks in these portfolios would typically be regarded as not part of a feasible investment universe. This portfolio formation method also makes it difficult to make inferences about the pervasiveness of the value premium given that the method results in the majority of portfolios comprising stocks with potential illiquidity issues, stale prices and the consequent impact on returns.

As indicated earlier, method 1 is the dominant approach used in the extant literature. The key message from our results is that caution is required before reaching conclusions about the systematic nature of any returns characteristic of the portfolios. These findings also have relevance for testing asset pricing models that rely upon similar approaches to portfolio formation. An example is Docherty et al. (2010) who find evidence of a ‘tangibility premium’ in small companies but not in big companies. Table 3 (p 12) from Docherty et al. (2010) reports the median market capitalization of these ‘small’ stocks as approximately $7 million. From our estimates, these small stocks would make up approximately 0.5% of total market capitalization, on average. Thus the evidence of a ‘tangibility premium’ may not be economically relevant.

A further consequence of this method of portfolio construction is the production of portfolios with high mean book-to-market ratios. This is likely due to the high book-to-market values associated with the tiny stocks that dominate the four smallest size portfolios. For instance, in Panel B, the book-to-market ratios for the Australian

portfolios are generally greater than those in the US portfolios (Panel A) but the greatest contrast is between the value portfolios.

Panel C in Table 1 displays summary statistics of portfolios constructed under Method 2. Under this approach, as described in the previous section, the five size portfolios are created by ensuring that pre-determined percentages of total market capitalization are represented in each quintile, where those percentages approximate those found in the US market. For example, Panel C shows the large size portfolio at around 75% of total market capitalization, close to the 73.6% of Fama and French (2006) in Panel A but much less than 94.6% as reported under Method 1 in Panel B.

The new portfolio construction approach in Panel C generates a number of key differences as compared to Panel B. Most importantly, by design, the smaller size groups now represent a much larger proportion of total market capitalization. For example, the two smallest size groups together now account for 5% of total market capitalization compared to 0.5% previously. The reason for this change is due to a higher number of stocks included in the smaller size portfolios. For example, Panel C shows that 60% of companies are now in the micro portfolio compared with 20% in Panel B, and this corresponds much closer with the US evidence (of 58% in Panel A). The new approach lifts the mean market capitalization of all portfolios, in particular the small size portfolios. Hence, where in method 1 the second largest size portfolio begins is now where size portfolio 4 approximately begins. We argue that this method provides a better match with practical investment considerations.

Of some surprise is the change in distribution of stocks across the value-growth spectrum as we move from Method 1 to Method 2. As previously noted, Panel B shows a concentration of growth stocks in the large size portfolios which reverses as we move down the size groups such that there is a concentration of value stocks in the micro portfolios. With the new portfolio construction approach in Panel C, the movement of stocks out of the large size portfolios is non-uniform across the book-to-market dimension. Many more growth stocks than value stocks are lost from the large portfolios suggesting that the previously observed concentration of growth stocks in the large portfolios was driven by a number of relatively small companies. Panel C demonstrates that amongst truly large (and even mid-cap) stocks, they are just as likely to be growth stocks as value stocks.

One potential issue using this method is the small number of companies that enter some portfolios - for example the large-value portfolio contains only 7 companies, on average, over the 25 year time period.[7] This attribute could lead to concentrated and potentially volatile portfolios, although as demonstrated in the next section, the volatility of returns across different portfolio compositions is of similar magnitude.

In Panel D of Table 1, size breakpoints are now based on grouping stocks roughly consistent with major Australian indices. That is, Panel D reports on Method 3. Of note,

[7] Although, the same large-value portfolio formed using Ken French data from the period 1926-1963 results in a similar small number of companies of just 9 stocks in the portfolio.

any stock outside of the top 500 falls into the micro portfolio. Hence, from a practical perspective, the micro portfolios are unlikely to be of interest. The main consequence of changing the size breakpoint from Method 2 to Method 3 is to push stocks out of the two extreme size groups into their adjacent size groups. As a result, the large portfolios experience a bigger mean market capitalization while the micro portfolios have a smaller mean market capitalization and hence make up a smaller proportion of total market capitalisation. There is no notable change in the distribution of value and growth stocks within size groups.

Panel E reports on Method 4, which utilizes the same size breakpoints as Panel D but now within each size group stocks are ranked by book-to-market and assigned to quintiles with an equal number of stocks in each quintile. Thus, Panel E shows 20% of stocks assigned to each book-to-market portfolio. The most notable consequence of this change is to shift value stocks (and micro-value stocks in particular) into lower book-to-market portfolios. Hence, the book-to-market ratios in Panel E rise accordingly.

Finally, the evidence reported in Panel F is based on a reduced sample of stocks whereby a filter is applied to exclude stocks with prices of less than $0.20 ('penny dreadfuls').[8] As expected, the impact of the filter is almost totally restricted to the micro portfolios in which the average number of stocks reduces from 511 to 231 stocks. The mean market capitalization of the micro stocks consequently increases reflecting the loss of very small stocks.

4. Portfolio Returns

The key question that follows from the above discussion is how the various portfolios perform and whether interpretations of results could be affected by the portfolio construction method. As noted earlier, previous research in Australia has generally found that any value premium is restricted to the larger stocks and contrary to the evidence reported in the USA, the value premium is non-existent in the smaller stocks. Using the full sample of all listed stocks over a longer time-series, combined with the new portfolio formation methods, this study results in a more definitive analysis of the value premium in Australia. Our different portfolio methods also allow us to understand the prevalence of the size premium and whether it may only reside in extremely small stocks which may suffer from liquidity and other market microstructure issues. In addition by looking at portfolio formation methods that place more weight on larger and, in general, more liquid stocks we are able to understand the systematic nature of the value and size premium and potentially its investablity.

Table 2 provides the raw returns for the portfolios formed under Methods 1 and 2, together with a comparison against the returns reported for US portfolios by Fama and French (2006). Portfolio returns are constructed as value-weighted, consistent with prior research.

[8] Note that in some years this filter reduces the sample to less than 500 stocks meaning that the smallest size portfolio does not have a full 300-month return series. The years in which there is less than 500 stocks are 1982 and 1991. In 1992 and 1993 we have just over 500 stocks.

INSERT TABLE 2 (Appended)

First, Panel A of Table 2 reports the findings of Fama and French (2006) wherein the US value premium is strongest in the smallest stocks. Turning to the Australian evidence, Panel B reports the returns from Method 1 which involves sorting stocks into quintile portfolios where each portfolio contains an equal number of stocks.

The raw returns on nearly all portfolios in Panel B are positive and significant, which is a reflection of the bullish state of the market over the sample period. However, it is the relative difference in portfolio performance that is of most interest which is represented by the 'Value minus Growth' (VMG) portfolio in the last column of Panel B. Recall that the portfolio construction method used in Panel B has been the dominant method used in prior work. Consistent with prior findings in the Australian market, returns to high book-to-market portfolios are greater than low portfolios for the larger portfolios, and this difference is statistically significant. However, the difference in returns between portfolios disappears for the two smallest portfolios. This latter finding is very much at odds with the US experience (eg Loughran, 1997) as evidenced in Panel A, where the value premium is strongest in the smaller stocks.

Panel C of Table 2 reports value-weighted returns for the portfolios formed using Method 2 whereby size portfolios are constructed on percentages of total market capitalization and book-to-market portfolios formed using breakpoints from the largest 200 stocks only. Comparing Panels B and C, the main difference is in the two smallest portfolios where the value premium is significant and much closer to that observed by Fama and French. A monotonic increase in the micro portfolio returns is now evident as we move from growth to value stocks. A similar pattern is evident in size portfolio 4. Note that the returns on the largest portfolio are similar across Methods 1 and 2 (ie. Panels B and C). The returns on the middle sized portfolios are less under Method 2, consistent with stocks being pushed into smaller portfolios.

The magnitude of the value premium is very large compared to the US experience. In the largest portfolio which is likely to contain very liquid and large companies in Australia, the value premium is almost 1% per month compared to 13 basis points observed in the US market. A premium of this magnitude is clearly of economic significance. The size of the premium remains after adjusting for market movements. For instance, in the large portfolio, the difference between value and growth portfolios on a market-adjusted basis is 0.98% per month while for the micro portfolio the difference is 0.72% per month. Finally, note that the standard deviations show that returns to growth portfolios are generally more volatile than returns to value portfolios, indicating that a self-financing strategy would be more sensitive to the short position rather than the long position.

A further feature of Table 2 is the change in the size premium. Aside from the growth portfolio, the US findings indicate a consistent size premium of around 30-50 basis points between the extreme size portfolios. In Australia, the size premium has been maintained as a constant feature of prior research as evidenced by Panel B. For example, Durand et al. (2007) studying the size anomaly using a method similar to method 1 concludes that

'the results show that in Australia the size premium was present over our entire sample period' (p318). Looking at Table 3 in Durand et al. (2007) would suggest that the large size premium is present mainly in the smallest size quintile portfolio, which would roughly correspond to our Micro portfolio[9]. Our results in Table 2 panel B confirm this results and would suggest a size premium that exceeded 2% per month across each of the book-to-market sorts, which is consistent with previous research on the size premium in Australia (Brown, et al., 1983; Durand, et al., 2007; Gaunt, et al. 2000). The magnitude of such a premium is staggering if it were realizable. Recall Panel B in Table 1 where we found that that Micro portfolio makes up, on average, a total market capitalization of 0.1%. Hence the evidence of the 'size premium' could just be a manifestation of liquidity and market microstructure issues in these extremely small stocks. This is somewhat confirmed when analyzing the results to Method 2 which finds the size premium is non-existent in the bottom 2% of total market capitalization. Hence, Method 2 eliminates a long-standing 'anomaly' from prior studies.

To summarize, we confirm that the value premium is present only in larger portfolios when portfolios are constructed using a portfolio formation method that results in an equal number of stocks in each portfolio as has been the dominant method in prior research. In addition we find that the long standing size premium is present in Australia when using the traditional method and is extremely large. However, when portfolios are formed using size and book-to-market breakpoints that more closely align with both feasible investment sets and US research, a large and significant value premium is present across all size ranges. The magnitude of the value premium is economically significant. In contrast, the size premium is negligible at best. These results may indicate the reason previous studies using the traditional portfolio formation method did not find a significant value premium in the smallest stocks is because it was being clouded by liquidity and market microstructure issues leading to large abnormal returns in these stocks. By using method 2 we have more confidence on the systematic nature of the value premium given that the portfolios are more closely aligned with feasible investment sets.

Table 3 reports both raw and market-adjusted returns for the remaining three alternative portfolio construction methods. Panel A reports on Method 3 which uses size breakpoints based on typical Australian stock index groupings rather than percentages of total market capitalization. Recall in the discussion of Table 1 that the main impact of changing the way the size portfolios are created is to shift stocks out of the two extreme size portfolios and into the adjacent size groups, which results in the large stocks getting bigger and the micro stocks getting smaller.

INSERT TABLE 3 (Appended)

There is little impact on raw returns from the change in method for the larger portfolios, with the value premium remaining intact at around 1%. However, there is a significant fall in the value premium on the micro portfolio principally driven by a large increase in returns to the growth (micro) portfolio. When these returns are adjusted for market

[9] Brown et al (1983) and Gaunt et al. (2000) also found that the size premium in Australia is generally only found in the smallest size portfolio.

movements, as expected, returns across all portfolios fall. The growth portfolios all under-perform the market with the exception of the micro portfolio. However, the value premium remains as the market adjustment produces a constant reduction in all portfolio returns. The consistent finding of a value premium in the top 500 should be of interest to portfolio managers.

Panel B of Table 3 reports on Method 4. Recall that the effect of this portfolio construction method was to shift a large number of value stocks down into lower book-to-market portfolios, particularly amongst the smaller stocks. This change in method has little impact on raw or market-adjusted returns compared to Method 3. That is, the portfolio returns do not appear particularly sensitive to the book-to-market sort compared to the size sort.

Panel C of Table 3 reports on Method 5 which uses the same approach to building portfolios as Method 4 except that stocks with a share price less than 20 cents are excluded. Recall from Table 1 that the main impact of this was a significant reduction in the number of micro stocks. Hence, it is not surprising to find the dominant effect of this change is on the returns of the micro portfolios. As might be expected, the raw and market-adjusted returns of all micro portfolios are now lower whereas the returns on the four larger portfolios remain substantially unchanged. In addition there is evidence of a value premium in all size categories that monotonically increases from large to micro. This result is suggestive that liquidity and market microstructure issues are 'hiding' the value premium in stocks outside of the top 500 in Australia[10].

It is interesting to also compare how the 'size premium' changes with the application of a simple share price filter. Using method 4 there is evidence of a size premium of around 0.8% across the value portfolios but applying this share price filter in method 5 removes this size premium. This is again suggestive that the long-standing size anomaly in Australia is present because of liquidity and market microstructure issues in extremely small stocks.

Summarizing Table 3, the changes in portfolio construction method do not substantially alter the returns for the larger portfolios, however, there are impacts on the micro portfolios with little evidence of the size premium once 'penny dreadfuls' are removed. We also find that the 'penny dreadfuls' could be masking the value premium in micro stocks as once these stocks are removed we find a large value premium evident across all size groupings.

5. Conclusion

Prior studies of the value premium have employed a portfolio formation technique where an equal number of stocks enter each sort. This approach results in the majority of portfolios containing only a small proportion of investable stocks. From a practical

[10] It is interesting to note that Brailsford and O'Brien (2008) find a similar result for momentum with stocks outside of the top 500 showing no evidence of momentum.

investment perspective, it is important to know the characteristics of the portfolios in which supposed premiums reside (Loughran, 1997; Fama and French, 2008).

For instance, we show that in Australia, the traditional size sort leads to a very high proportion (around 95%) of total market capitalization being accounted for by stocks in just one size quintile. While the three smallest size quintiles make up just 1.5% of total market capitalization. In comparison, the largest stock size quintile in the US market comprises around 75% of total market capitalization, while the three smallest size quintiles in the US market still contain over 12% of total market capitalization. The large proportion of market value represented by just one size quintile is potentially problematic. It makes a meaningful comparison with benchmark studies difficult, and raises questions as to how much importance can be placed on an analysis where the majority of portfolios represent such an insignificant proportion of total market capitalization.

We analyse different portfolio formation methods using a variety of breakpoints. The two broad approaches either employ breakpoints that match the proportion of total market capitalization between markets or breakpoints that mirror market indexes to reflect the different investible parts of the stock market.

The results from the different methods lead to different conclusions. For example, previous studies in Australia find evidence of the value premium only being present in the largest stocks, in contrast to the results from the US market. We highlight that the absence of a value premium in smaller stocks is true only for extremely small stocks. Once we form portfolios that more represent more realistic investment sets, we find a value premium that is systematic across all size categories and generally increases inversely with size. This value premium is around 1% per month which is significantly larger than that documented elsewhere. This large premium is present even within portfolios that mirror market indices, although we note some of the resultant portfolios comprise relatively few stocks which itself raises concerns over diversification strategies.

These findings are likely to be of interest to portfolio managers. The results reveal the value premium in Australia is a pervasive, market-wide characteristic that is not limited to small, illiquid stocks. In contrast, we find the previously pervasive size premium largely disappears once portfolios are formed that better represent feasible investment sets and once ‘penny dreadfuls’ are removed.

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Table 1 – Summary statistics for various Size-BM portfolios

Panel A: Summary statistics of US portfolios from Fama and French (2006). Size breakpoints are determined by sorting NYSE stocks by market capitalization. BM breakpoints are determined by sorting NYSE stocks by BM. These breakpoints are then applied to all stocks from NYSE, AMEX and Nasdaq.

Panel A1: Average Number of Companies in each Portfolio

	Growth	2	3	4	Value	Total
Large	108	66	52	43	26	295
2	100	75	64	53	35	327
3	121	88	81	67	48	405
4	163	117	114	103	79	576
Micro	532	337	338	402	645	2254
Total	1,024	683	649	668	833	

Panel A2: % of Total Number of Companies

	Growth	2	3	4	Value	Total
Large	2.8%	1.7%	1.3%	1.1%	0.7%	7.6%
2	2.6%	1.9%	1.7%	1.4%	0.9%	8.5%
3	3.1%	2.3%	2.1%	1.7%	1.2%	10.5%
4	4.2%	3.0%	3.0%	2.7%	2.0%	14.9%
Micro	13.8%	8.7%	8.8%	10.4%	16.7%	58.4%
Total	26.5%	17.7%	16.8%	17.3%	21.6%	

Panel A3: Mean Market Capitalization ($ millions)

	Growth	2	3	4	Value
Large	10,240	7,658	6,608	5,454	5,001
2	1,147	1,142	1,150	1,160	1,156
3	444	452	453	456	464
4	186	188	191	189	185
Micro	39	42	40	36	27

Panel A4: % of Total Market Capitalization

	Growth	2	3	4	Value	Total
Large	32.8%	15.5%	11.6%	9.0%	4.7%	73.6%
2	3.9%	2.9%	2.6%	2.2%	1.5%	13.1%
3	1.9%	1.4%	1.3%	1.1%	0.1%	5.8%
4	1.1%	0.8%	0.8%	0.7%	0.5%	3.9%
Micro	0.7%	0.5%	0.5%	0.5%	0.7%	2.9%
Total	40.4%	21.1%	16.8%	13.5%	7.5%	

Panel A5: Mean Book-to-market Ratios

	Growth	2	3	4	Value
Large	0.26	0.53	0.75	0.99	1.49
2	0.27	0.55	0.75	1.02	1.62
3	0.27	0.54	0.75	1.00	1.62
4	0.27	0.55	0.75	1.02	1.62
Micro	0.27	0.57	0.77	1.02	1.77

Panel B: Method 1: Summary statistics of Australian portfolios constructed using the approach of prior Australian studies. All stocks are sorted by market capitalization and broken into five size groups with equal number of stocks in each group. Independently, all stocks are sorted by BM and broken into five groups with equal number of stocks in each group.

Panel B1: Number of Companies

	Growth	2	3	4	Value	Total
Large	52	53	43	25	10	183
2	40	42	41	39	23	185
3	34	35	39	39	38	185
4	30	31	34	42	48	185
Micro	29	23	29	39	65	185
Total	185	184	186	184	184	

Panel B2: % of Total Number of Companies

	Growth	2	3	4	Value	Total
Large	5.6%	5.7%	4.7%	2.7%	1.1%	19.8%
2	4.3%	4.6%	4.4%	4.2%	2.5%	20.0%
3	3.7%	3.8%	4.2%	4.2%	4.1%	20.0%
4	3.3%	3.4%	3.7%	4.6%	5.2%	20.0%
Micro	3.1%	2.5%	3.1%	4.2%	7.0%	20.0%
Total	20.0%	19.9%	20.2%	19.9%	19.9%	

Panel B3: Mean Market Capitalization ($ millions)

	Growth	2	3	4	Value
Large	1,895	2,094	1,526	1,042	1,687
2	70	69	67	69	66
3	20	20	19	19	19
4	8	8	7	7	7
Micro	3	3	3	3	2

Panel B4: % of Total Market Capitalization

	Growth	2	3	4	Value	Total
Large	29.3%	33.0%	19.5%	7.8%	5.0%	94.6%
2	0.8%	0.9%	0.8%	0.8%	0.4%	3.8%
3	0.2%	0.2%	0.2%	0.2%	0.2%	1.1%
4	0.1%	0.1%	0.1%	0.1%	0.1%	0.4%
Micro	0.0%	0.0%	0.0%	0.0%	0.0%	0.1%
Total	30%	34%	21%	9%	6%	

Panel B5: Mean Book-to-market Ratios

	Growth	2	3	4	Value
Large	0.31	0.60	0.88	1.27	2.57
2	0.30	0.60	0.89	1.28	7.58
3	0.28	0.60	0.90	1.31	3.69
4	0.28	0.61	0.89	1.30	2.93
Micro	0.26	0.60	0.90	1.31	4.88

Panel C: Method 2: Summary statistics of Australian portfolios constructed using an approach that parallels Fama and French. Size breakpoints are determined by percentage of total market capitalization and BM breakpoints are determined by sorting the top 200 stocks only on BM and applying these breakpoints to the rest of the market.

Panel C1: Number of Companies

	Growth	2	3	4	Value	Total
Large	11	15	14	12	7	59
2	20	16	17	19	18	91
3	18	17	17	18	28	97
4	27	21	24	29	52	153
Micro	88	70	74	97	281	610
Total	164	138	147	176	386	

Panel C2: % of Total Number of Companies

	Growth	2	3	4	Value	Total
Large	1.1%	1.5%	1.4%	1.1%	0.7%	5.8%
2	2.0%	1.6%	1.7%	1.9%	1.8%	9%
3	1.7%	1.6%	1.7%	1.8%	2.7%	9.6%
4	2.7%	2.1%	2.3%	2.9%	5.1%	15.1%
Micro	8.8%	6.9%	7.4%	9.6%	27.8%	60.4%
Total	16.2%	13.7%	14.5%	17.4%	38.2%	

Panel C3: Mean Market Capitalization ($ millions)

	Growth	2	3	4	Value
Large	5,129	6,288	5,341	3,871	4,507
2	694	699	659	653	619
3	207	211	212	216	206
4	74	75	75	73	75
Micro	12	13	13	12	10

Panel C4: % of Total Market Capitalization

	Growth	2	3	4	Value	Total
Large	16.4%	21.3%	17.1%	12.7%	7.7%	75.2%
2	3.3%	2.9%	2.9%	3.1%	2.7%	14.9%
3	0.9%	0.8%	0.9%	0.9%	1.4%	5.0%
4	0.5%	0.4%	0.5%	0.6%	1.0%	3.0%
Micro	0.3%	0.3%	0.3%	0.4%	0.8%	2.0%
Total	21%	26%	22%	18%	14%	

Panel C5: Mean Book-to-market Ratios

	Growth	2	3	4	Value
Large	0.30	0.53	0.72	0.96	1.61
2	0.28	0.53	0.73	0.97	1.78
3	0.28	0.53	0.72	0.97	2.00
4	0.27	0.54	0.73	0.98	1.87
Micro	0.25	0.53	0.73	0.97	2.80

Table 1 – continued

Panel D: Method 3: Size breakpoints are determined by groupings that parallel major indices (eg. large = Top 50 stocks; portfolio 2 = stocks 51 to 200, portfolio 3 = stocks 201-300, portfolio 4 = stocks 301 to 500, portfolio 5 = stocks beyond 500) and BM breakpoints are determined by sorting the top 200 stocks only on BM and applying these breakpoints to the rest of the market.

Panel D1: Number of Companies

	Growth	2	3	4	Value	Total
Large	10	13	12	10	6	50
2	30	27	28	30	34	150
3	18	15	17	20	31	100
4	34	27	29	37	73	200
Micro	72	57	61	79	242	511
Total	164	138	147	176	386	

Panel D2: % of Total Number of Companies

	Growth	2	3	4	Value	Total
Large	1.0%	1.3%	1.2%	1.0%	0.6%	4.9%
2	3.0%	2.7%	2.8%	3.0%	3.4%	14.8%
3	1.8%	1.5%	1.7%	1.9%	3.0%	9.9%
4	3.4%	2.7%	2.9%	3.7%	7.3%	19.8%
Micro	7.2%	5.6%	6.0%	7.8%	23.9%	50.5%
Total	16.2%	13.7%	14.5%	17.4%	38.2%	

Panel D3: Mean Market Capitalization ($ millions)

	Growth	2	3	4	Value
Large	5548	6848	5798	4287	5093
2	565	588	560	567	487
3	120	121	123	122	120
4	44	44	44	43	44
Micro	9	9	9	8	7

Panel D4: % of Total Market Capitalization

	Growth	2	3	4	Value	Total
Large	15.9%	20.5%	16.4%	12.1%	7.2%	72.0%
2	4.3%	4.2%	4.2%	4.3%	4.1%	21.2%
3	0.6%	0.5%	0.6%	0.6%	1.0%	3.2%
4	0.4%	0.3%	0.4%	0.4%	0.8%	2.4%
Micro	0.2%	0.2%	0.2%	0.2%	0.5%	1.2%
Total	21.4%	25.7%	21.7%	17.7%	13.6%	

Panel D5: Mean Book-to-market Ratios

	Growth	2	3	4	Value
Large	0.30	0.53	0.73	0.96	1.61
2	0.28	0.53	0.73	0.97	1.74
3	0.27	0.53	0.73	0.97	2.14
4	0.27	0.53	0.73	0.97	2.07
Micro	0.25	0.52	0.73	0.97	2.84

Panel E: Method 4: Size breakpoints are determined by groupings that parallel major indices (eg. large = Top 50 stocks; portfolio 2 = stocks 51 to 200, portfolio 3 = stocks 201-300, portfolio 4 = stocks 301 to 500, portfolio 5 = stocks beyond 500) and BM breakpoints are determined by assigning stocks to quintiles within each size group.

Panel E1: Number of Companies

	Growth	2	3	4	Value	Total
Large	10	10	10	10	10	50
2	30	30	30	30	30	150
3	20	20	20	20	20	100
4	40	40	40	40	40	200
Micro	102	102	102	102	102	511
Total	202	202	202	202	202	

Panel E2: % of Total Number of Companies

	Growth	2	3	4	Value	Total
Large	1.0%	1.0%	1.0%	1.0%	1.0%	4.9%
2	3.0%	3.0%	3.0%	3.0%	3.0%	14.8%
3	2.0%	2.0%	2.0%	2.0%	2.0%	9.9%
4	4.0%	4.0%	4.0%	4.0%	4.0%	19.8%
Micro	10.1%	10.1%	10.1%	10.1%	10.1%	50.5%
Total	20%	20%	20%	20%	20%	

Panel E3: Mean Market Capitalization ($ millions)

	Growth	2	3	4	Value
Large	5639	7129	6427	4357	4617
2	578	580	551	559	488
3	120	121	124	123	119
4	44	45	43	44	43
Micro	9	9	8	8	6

Panel E4: % of Total Market Capitalization

	Growth	2	3	4	Value	Total
Large	16.1%	16.6%	14.5%	12.7%	12.1%	72.0%
2	4.2%	4.5%	4.5%	4.2%	3.6%	21.2%
3	0.6%	0.6%	0.7%	0.7%	0.6%	3.2%
4	0.5%	0.5%	0.5%	0.5%	0.5%	2.4%
Micro	0.3%	0.3%	0.2%	0.2%	0.2%	1.2%
Total	21.7%	22.6%	20.4%	18.3%	17.0%	

Panel E5: Mean Book-to-market Ratios

	Growth	2	3	4	Value
Large	0.32	0.52	0.67	0.85	1.36
2	0.28	0.54	0.75	1.01	1.82
3	0.30	0.60	0.84	1.14	2.49
4	0.31	0.64	0.92	1.27	2.66
Micro	0.32	0.71	1.08	1.59	4.62

Panel F: Method 5: Size breakpoints are determined by groupings that parallel major indices (eg. large = Top 50 stocks; portfolio 2 = stocks 51 to 200, portfolio 3 = stocks 201-300, portfolio 4 = stocks 301 to 500, portfolio 5 = stocks beyond 500) and BM breakpoints are determined by assigning stocks to quintiles within each size group. A filter is applied to exclude stocks with a price of less than 20 cents.

Panel F1: Average Number of Companies in each Portfolio

	Growth	2	3	4	Value	Total
Large	10	10	10	10	10	50
2	30	30	30	30	30	150
3	20	20	20	20	20	100
4	40	40	40	40	38	198
Micro	46	46	46	47	46	231
Total	146	146	146	147	144	

Panel F2: % of Total Number of Companies

	Growth	2	3	4	Value	Total
Large	1.4%	1.4%	1.4%	1.4%	1.4%	6.9%
2	4.1%	4.1%	4.1%	4.1%	4.1%	20.6%
3	2.7%	2.7%	2.7%	2.7%	2.7%	13.7%
4	5.5%	5.5%	5.5%	5.5%	5.5%	27.1%
Micro	6.3%	6.3%	6.4%	6.4%	6.3%	31.7%
Total	20.0%	20.0%	20.1%	20.1%	19.7%	

Panel F3: Mean Market Capitalization ($ millions)

	Growth	2	3	4	Value
Large	5639	7129	6427	4357	4617
2	578	580	551	558	488
3	119	121	123	123	118
4	43	43	42	43	42
Micro	12	12	11	10	9

Panel F4: % of Total Market Capitalization

	Growth	2	3	4	Value	Total
Large	16.2%	16.7%	14.6%	12.8%	12.2%	72.6%
2	4.3%	4.6%	4.5%	4.3%	3.7%	21.3%
3	0.6%	0.6%	0.7%	0.6%	0.6%	3.2%
4	0.5%	0.5%	0.5%	0.5%	0.4%	2.3%
Micro	0.2%	0.2%	0.1%	0.1%	0.1%	0.7%
Total	21.8%	22.6%	20.4%	18.3%	17.0%	

Panel F5: Mean Book-to-market Ratios

	Growth	2	3	4	Value
Large	0.32	0.52	0.67	0.85	1.36
2	0.28	0.54	0.75	1.01	1.82
3	0.30	0.60	0.84	1.13	2.46
4	0.33	0.66	0.94	1.31	2.78
Micro	0.35	0.74	1.04	1.49	4.67

Table 2 – Raw monthly returns for various Australian and US size-BM portfolios

Panel A: Raw monthly returns of US portfolios from Fama and French (2006). Size breakpoints are determined by sorting NYSE stocks by market capitalization. BM breakpoints are determined by sorting NYSE stocks by BM and applying these breakpoints to all stocks from NYSE, AMEX and Nasdaq.

Panel A1: Value-weighted monthly returns %

	Growth	2	3	4	Value	VMG
Large	0.90	0.97	0.98	1.05	1.06	0.13
2	1.01	0.99	1.22	1.34	1.37	0.36
3	0.90	1.22	1.20	1.35	1.51	0.37
4	0.89	1.15	1.40	1.45	1.55	0.48
Micro	0.73	1.32	1.36	1.57	1.67	0.59

Panel B: Method 1: Raw monthly returns of Australian portfolios. All stocks are sorted by market capitalization and broken into five size groups with equal number of stocks in each group. Independently, all stocks are sorted by BM and broken into five groups with equal number of stocks in each group.
* indicates significance at 5%; ** indicates significance at 1%

Panel B1: Value-weighted monthly returns %

	Growth	2	3	4	Value	VMG
Large	0.59	0.86**	1.15**	1.30**	1.60**	1.01 (2.75**)
2	0.21	0.79**	0.87**	0.97**	1.37**	1.16 (3.73**)
3	-0.54	0.65	0.91**	1.15**	1.38**	1.92 (6.30**)
4	0.96	1.78**	1.25**	1.49**	1.61**	0.65 (1.52)
Micro	2.85**	2.69**	3.24**	2.77**	3.34**	0.48 (1.15)

Panel B2: Standard deviation of monthly returns %

	Growth	2	3	4	Value	VMG
Large	5.41	5.34	5.26	5.91	6.69	6.33
2	6.55	5.05	4.92	4.55	5.82	5.37
3	7.98	6.23	5.47	4.90	6.15	5.26
4	10.44	8.66	7.44	6.51	7.01	7.41
Micro	11.19	10.87	9.78	8.52	8.25	7.29

Panel B3: Value-weighted market-adjusted returns %

	Growth	2	3	4	Value
Large	-0.61**	-0.34**	-0.05	0.10	0.40
2	-0.99**	-0.41*	-0.33	-0.23	0.17
3	-1.74**	-0.55*	-0.29	-0.05	0.18
4	-0.24	0.58	0.05	0.29	0.41
Micro	1.65**	1.49*	2.04**	1.57**	2.14**

Panel B4: Standard deviation of market-adjusted returns %

	Growth	2	3	4	Value
Large	2.60	1.95	2.47	3.61	5.49
2	4.42	3.29	3.25	3.03	4.46
3	6.12	4.90	4.44	4.09	4.70
4	8.84	7.35	6.43	5.80	5.62
Micro	10.10	9.86	8.80	7.79	7.17

Panel C: Method 2: Raw monthly returns of Australian portfolios constructed. Size breakpoints are determined by percentage of total market capitalization and BM breakpoints are determined by sorting the top 200 stocks only on BM and applying these breakpoints to the rest of the market.
* indicates significance at 5%; ** indicates significance at 1%

Panel C1: Value-weighted monthly returns %

	Growth	2	3	4	Value	VMG
Large	0.66*	1.08**	1.27**	1.33**	1.64**	0.98 (2.82**)
2	0.73*	1.04**	1.27**	1.16**	1.42**	0.70 (2.65**)
3	0.13	1.11**	1.27**	0.83**	1.51**	1.38 (4.34**)
4	0.38	0.64*	0.93**	1.08**	1.23**	0.85 (2.70**)
Micro	0.84	1.04*	1.23**	1.40**	1.56**	0.72 (2.38*)

Panel C2: Standard deviation of monthly returns %

	Growth	2	3	4	Value	VMG
Large	5.60	5.07	5.16	4.82	6.47	6.03
2	6.37	4.87	4.87	4.44	4.29	4.56
3	6.58	5.36	5.17	4.36	4.29	5.52
4	7.46	5.10	5.30	4.17	4.45	5.42
Micro	8.74	6.96	5.82	5.68	5.24	5.24

Panel C3: Value-weighted market-adjusted returns %

	Growth	2	3	4	Value
Large	-0.54*	-0.11	0.08	0.13	0.44
2	-0.47*	-0.16	0.07	-0.04	0.23
3	-1.07**	-0.09	0.07	-0.37	0.31
4	-0.82*	-0.56*	-0.27	-0.12	0.03
Micro	-0.36	-0.16	0.03	0.20	0.36

Panel C4: Standard deviation of market-adjusted returns %

	Growth	2	3	4	Value
Large	3.59	2.11	2.25	2.86	4.27
2	3.80	2.82	2.83	2.65	2.69
3	5.10	3.87	3.56	3.34	3.02
4	5.43	4.16	4.19	3.55	3.14
Micro	7.02	5.45	4.95	4.65	4.07

Table 3 – Raw and market-adjusted returns for alternative portfolio construction methods

Panel A: Method 3: Returns and standard deviations of Australian portfolios. Size breakpoints are determined by groupings that parallel major indices (eg. large = Top 50 stocks; portfolio 2 = stocks 51 to 200) and BM breakpoints are determined by sorting the top 200 stocks only on BM and applying these breakpoints to the rest of the market.
* indicates significance at 5%; ** indicates significance at 1%

Panel A1: Value-weighted raw returns %

	Growth	2	3	4	Value	VMG
Large	0.58	1.12**	1.29**	1.33**	1.69**	1.11 (3.05**)
2	0.65	1.02**	1.30**	1.14**	1.44**	0.79 (3.28**)
3	0.47	0.93**	1.00**	1.10**	1.38**	0.92 (2.86**)
4	0.35	0.96**	0.88**	1.21**	1.33**	0.99 (2.96**)
Micro	1.69**	1.62**	1.86**	1.71**	2.13**	0.43 (1.20)

Panel A2: Standard deviation of raw returns %

	Growth	2	3	4	Value	VMG
Large	5.77	5.09	5.33	4.89	6.49	6.31
2	6.42	4.80	4.55	4.23	4.10	4.18
3	6.76	5.89	5.32	4.35	4.50	5.55
4	8.25	5.96	5.38	4.60	4.62	5.77
Micro	10.10	10.31	7.47	6.64	6.39	6.27

Panel A3: Value-weighted market-adjusted returns %

	Growth	2	3	4	Value
Large	-0.62**	-0.08	0.09	0.13	0.50*
2	-0.55*	-0.18	0.10	-0.06	0.24
3	-0.73*	-0.27	-0.20	-0.10	0.19
4	-0.85*	-0.23	-0.31	0.02	0.13
Micro	0.50	0.42	0.67	0.51	0.93**

Panel A4: Standard deviation of market-adjusted returns %

	Growth	2	3	4	Value
Large	4.00	2.20	2.42	2.89	4.25
2	3.69	2.42	2.51	2.52	2.35
3	5.17	4.32	3.81	3.33	3.24
4	6.46	4.95	4.38	3.94	3.34
Micro	8.76	9.07	6.40	5.56	5.13

Panel B: Method 4: Returns and standard deviations of Australian portfolios. Size breakpoints are determined by groupings that parallel major indices (eg. large = Top 50 stocks; portfolio 2 = stocks 51 to 200) and BM breakpoints are determined by assigning stocks to quintiles within each size group.
* indicates significance at 5%; ** indicates significance at 1%

Panel B1: Value-weighted raw returns %

	Growth	2	3	4	Value	VMG
Large	0.84**	1.00**	1.12**	1.28**	1.64**	0.80 (2.70**)
2	0.67	1.02**	1.19**	1.21**	1.43**	0.76 (3.08**)
3	0.35	0.99**	1.09**	1.18**	1.32**	0.97 (3.10**)
4	0.52	0.87**	1.08**	1.20**	1.57**	1.05 (3.27**)
Micro	1.76**	1.59**	1.74**	2.13**	2.34**	0.57 (1.55)

Panel B2: Standard deviation of raw returns %

	Growth	2	3	4	Value	VMG
Large	5.54	5.27	5.36	4.88	5.51	5.12
2	6.50	4.74	4.55	4.27	4.17	4.28
3	6.68	5.22	4.98	4.04	5.04	5.44
4	7.58	5.10	4.68	4.65	5.43	5.57
Micro	9.65	7.27	6.45	6.63	7.22	6.44

Panel B3: Value-weighted market-adjusted returns %

	Growth	2	3	4	Value
Large	-0.36	-0.20	-0.08	0.08	0.44*
2	-0.53*	-0.17	0.00	0.01	0.23
3	-0.85**	-0.21	-0.11	-0.02	0.12
4	-0.68*	-0.33	-0.12	0.00	0.37
Micro	0.57	0.40	0.54	0.93**	1.14**

Panel B4: Standard deviation of market-adjusted returns %

	Growth	2	3	4	Value
Large	3.49	2.59	2.78	2.61	3.01
2	3.68	2.33	2.64	2.56	2.43
3	4.80	3.73	3.45	3.36	3.81
4	5.85	4.02	3.85	3.63	4.20
Micro	8.24	5.94	5.34	5.60	5.89

Panel C: Method 5: Returns and standard deviations of Australian portfolios. Size breakpoints are determined by groupings that parallel major indices (eg. large = Top 50 stocks; portfolio 2 = stocks 51 to 200) and BM breakpoints are determined by assigning stocks to quintiles within each size group. A filter is applied to exclude stocks with a price of less than 20 cents.
* indicates significance at 5%; ** indicates significance at 1%

Panel C1: Value-weighted raw returns %

	Growth	2	3	4	Value	VMG
Large	0.84**	1.00**	1.12**	1.28**	1.64**	0.80 (2.70**)
2	0.67	1.02**	1.20**	1.21**	1.44**	0.77 (3.11**)
3	0.30	1.03**	1.13**	1.13**	1.37**	1.07 (3.36**)
4	0.55	0.78**	1.13**	1.38**	1.71**	1.16 (3.31**)
Micro	0.56	1.32**	1.21**	1.31**	1.89**	1.27 (2.70**)

Panel C2: Standard deviation of raw returns %

	Growth	2	3	4	Value	VMG
Large	5.54	5.27	5.36	4.88	5.51	5.12
2	6.50	4.74	4.55	4.24	4.14	4.27
3	6.68	5.21	4.94	3.90	4.98	5.51
4	6.88	4.97	4.41	4.29	6.11	6.08
Micro	8.60	6.52	5.78	4.57	5.94	7.78

Panel C3: Value-weighted market-adjusted returns %

	Growth	2	3	4	Value
Large	-0.36	-0.20	-0.08	0.08	0.44*
2	-0.53*	-0.18	0.00	0.01	0.24
3	-0.90**	-0.17	-0.07	-0.06	0.17
4	-0.65*	-0.42	-0.07	0.18	0.51
Micro	-0.70	0.07	-0.04	0.08	0.65*

Panel C4: Standard deviation of market-adjusted returns %

	Growth	2	3	4	Value
Large	3.49	2.59	2.78	2.61	3.01
2	3.68	2.34	2.65	2.56	2.40
3	4.76	3.68	3.53	3.31	3.74
4	5.39	3.99	3.83	3.49	5.30
Micro	7.58	6.00	4.84	4.60	5.39